Can Social Network Analysis Inform African Development Policies?

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Can Social Network Analysis Inform African Development policies ?

An application to food security, market analysis and gender

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Executive Summary

The way people are connected massively influences social behaviours, political choices, and economic success. As sociologists have shown, social structures – and not just individual characteristics – contribute to explaining who is more likely to contract the flu, turn into a drug addict, become obese, or get killed by a gang. Social structures also constrain how information, resources and power flow between civil society, lobbyist groups and the government. Networks can facilitate the diffusion of political ideas across social groups or, inversely, create tightly-knit communities of supporters that reinforce partisan views. Economic exchanges also benefit from social structures. Well-connected entrepreneurs who share trust obtain more reliable information on price and markets and better access to credit.[1]

Fuelled by conceptual and computational advances in network science and the growing popularity of social media, formal approaches that map and model social structure – known as Social Network Analysis or SNA – have spread across academic disciplines.[2] Thus far, however, the vast majority of these studies have been conducted in North America and Western Europe. In the rest of the world, where relational issues are just as important, the use of SNA to understand social structures is in its early stages. In Africa, especially, very little is known of the ties that bind individuals, groups and organizations, how they serve as channels for flows of material and information flows, and how they influence social, economic and political outcomes.

The objective of this note is to contribute to filling this gap, by showing how a more formal approach to social networks can inform current development policies in Sub-Saharan Africa.[3] After reviewing some of the studies conducted in Africa, we discuss how SNA can be used as a policy and empowerment tool by development and humanitarian organizations. Focusing on West Africa, we are particularly interested in the application of SNA to the fields of food security, market analysis and gender, three policy areas that, despite being fundamentally relational by nature, have received little attention from network science so far. The note shows that a better understanding of social structure can shed light on hidden constraints that ultimately influence social capital, integration and resilience and thus ideally complement existing approaches that focus on the attributes of the social actors instead of their relationships.

SOCIAL NETWORK ANALYSIS AND AFRICA

In the late 1960s, British sociologists and anthropologists were among the very first to apply an explicit network approach to understand kinship and patron–client relationships in Africa.[4] In spite of its conceptual interest, this community-based approach remained isolated for many years among social network scientists, who moved from Britain to the United States over the 1970s and formalized the principles of SNA based on mathematical models of social interactions. As a result, Sub-Saharan Africa has remained a terra incognita of SNA for many decades and it was not until the late 1990s that formal approaches to social networks were more systematically adopted on the continent.[5]

THE ECONOMIC BENEFITS OF EMBEDDEDNESS AND BROKERAGE

Many of the studies conducted in Africa thus far have addressed the returns of social networks for trade and manufacturing activities. In Madagascar, for example, traders who make extensive use of embedded ties have larger sales and generate more value added than those relying on arm's length transactions. In a business environment as uncertain as Sub-Saharan Africa, social networks facilitate the establishment of trust and long-term relationships[6]. Among small West African traders, the benefits of social networks on economic

> IN BURKINA FASO, SOCIAL NETWORKS THAT CONNECT URBAN ENTREPRENEURS WORKING IN THE INFORMAL SECTOR HAVE (...) A POSITIVE IMPACT ON ECONOMIC OUTCOMES

performance are heavily dependent on the type of people with whom they are connected. Small traders who have established strong ties to state representatives and politicians do better but those who frequently visit religious leaders have a lower monthly profit.[7] These findings illustrate that social networks can be simultaneously a resource that positively contributes to labour market outcomes and a social burden for those who face many social obligations[8].

In the manufacturing sector, studies conducted in Zimbabwe suggest that well connected entrepreneurs are more likely to invest in research and development (R&D) and quality management, leading them to be more innovative.[9] In Ethiopia, the sales and skills of small-scale manufacturers are positively correlated with the density of ties between micro-enterprises.[10] In Burkina Faso, social networks that connect urban entrepreneurs working in the informal sector provide access to suppliers and financial support and have, ultimately, a significant positive impact on economic outcomes.[11] In Uganda, urban entrepreneurs that have developed a dense social


Photo Credit : Marco Frattini ©

network have access to more financial and material resources. The most innovative entrepreneurs are those who are strongly embedded in a cohesive group of peers and have built numerous brokerage ties beyond their own community.[12]

SOCIAL NETWORKS, EMPLOYMENT OPPORTUNITIES AND INNOVATION

Social networks have also proved beneficial for matching workers and firms in the highly fragmented markets of Sub-Saharan Africa, where levels of qualifications are low, workers are mostly self-employed, and recruitment procedures are often based on word-of-mouth. Numerous studies point out that social networks enhance employment opportunities in countries as varied as South Africa, Ethiopia, and Burkina-Faso.[13]

Social networks can also help understand the diffusion of new technologies.[14] In rural Ethiopia, farmers who belong to the same ethnic or religious group as the agent in charge of promoting innovation are more likely to adopt a system of production that enhances productivity while preserving the environment than those who share no ethnic or religious bond.[15] Similar findings have been reached in the pineapple industry in Ghana, where novice farmers introduce agricultural innovation based on their information neighbourhood rather than on expert recommendations.[16] In Nairobi, micro-manufacturers are more likely to adopt new technologies and to produce higher quality products if they had developed business links with traders than if they sell directly to consumers.[17]


Photo Credit : Jenny Matthews ©

NETWORK ANALYSIS AS A POLICY TOOL

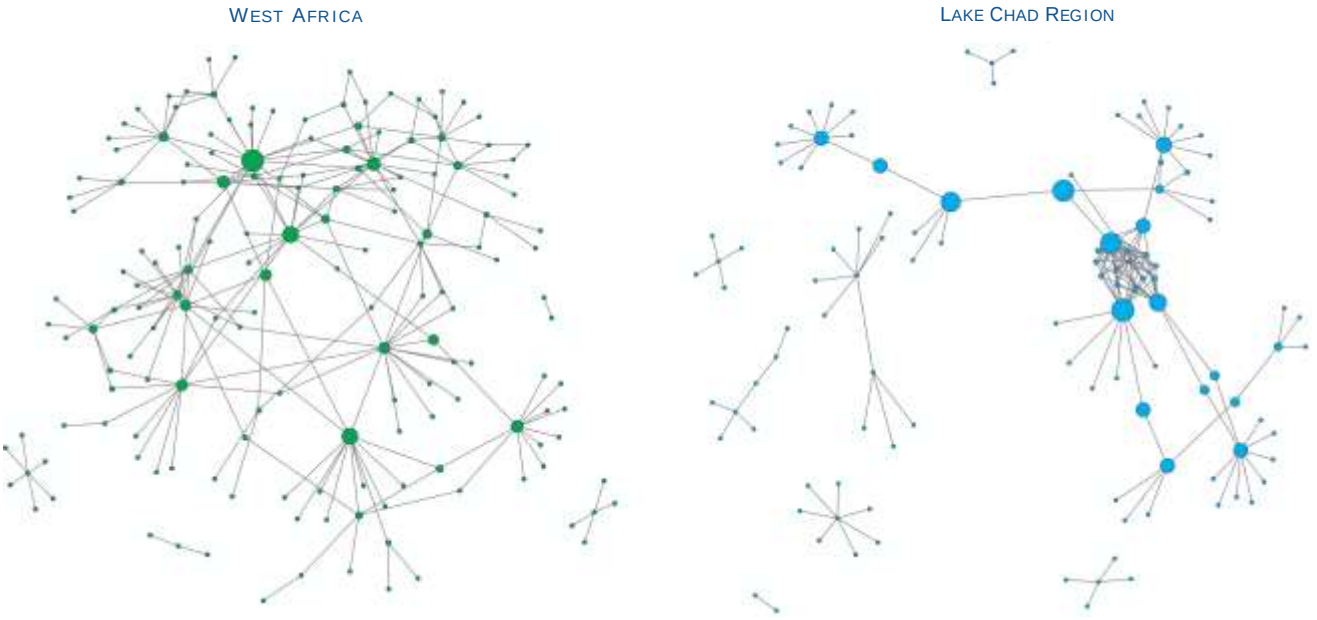
In addition to being a scientific tool, SNA can also serve as a policy tool that can help inform development policies. Since the late-2000s, a number of international organizations such as the World Bank, the International Fund for Agricultural Development (IFAD), the International Food Policy Research Institute (IFPRI) and the OECD have explored this channel.[18]

MAPPING POLICY NETWORKS

One of the strengths of SNA is that it allows one to map large numbers of actors whose connections are not immediately apparent and reveal underlying patterns that are independent from individual behaviours. In a recent study, the OECD Sahel and West Africa Club systematically used this approach to highlight how policy makers involved in cross-border cooperation were formally and informally connected to each other and how these networks were affected by national boundaries.[19] The study reveals that the structure of governance networks heavily influences the exchange of information and power between actors. In West Africa, policy actors are embedded in a decentralized network that relies on a few brokers, a structure that facilitates coordination between actors with highly diverse skills and levels of responsibility. Variations are also observable at the local level. In the Lake Chad region, for example, the governance network appears fragmented. Most of the key brokers – who often belong to the Lake Chad Basin Commission (LCBC) – form a subgroup of actors with relatively few connections to the rest of the network. The structural differences between the rather compact network of West African policy-makers and the fragmented network of the Lake Chad region are clearly visible on Figure 1, where policy makers are represented by nodes and connected to their peers if they exchange information related to cross-border cooperation.

A similar approach could be used to identify the various organizations involved in food security analysis and policies in Africa and identify possible bottlenecks that make the network less effective. This could be applied to the 20 regional organizations currently interacting as part of the Food Crisis Prevention Network for example.[20] Through the Regional System for the Prevention and Management of Food Crises (PREGEC), the search for consensus and co-ordination on the food security situation and debates around necessary responses are continuous. The network is an informal forum that discusses, shares, and coordinate information related to food and nutritional in the region, promoting coordinated action between several organizations, including the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), the Food and Agriculture Organization (FAO), the Famine Early Warning Systems Network (FEWS-NET) and the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). Until today the internal interactions between the members of this critical network have never been analysed and its exact ties are not understood. SNA would not only enable researchers and policy makers to identify who the people playing central roles (thought leaders, knowledge brokers, information managers), but also identify isolated actors, spot opportunities for improving knowledge flows, and target those areas where better knowledge sharing will have the most impact.

FIGURE 1. THE WEST AFRICAN AND LAKE CHAD CROSS-BORDER COOPERATION NETWORKS



Source: OECD/SWAC (2017), reproduced with permission. Note: The size of the nodes is proportional to their role as a broker within the network (betweenness centrality). The distance between actors is a social – rather than geographical – distance: structurally close actors appear close to each other.

Social networks, food security and markets

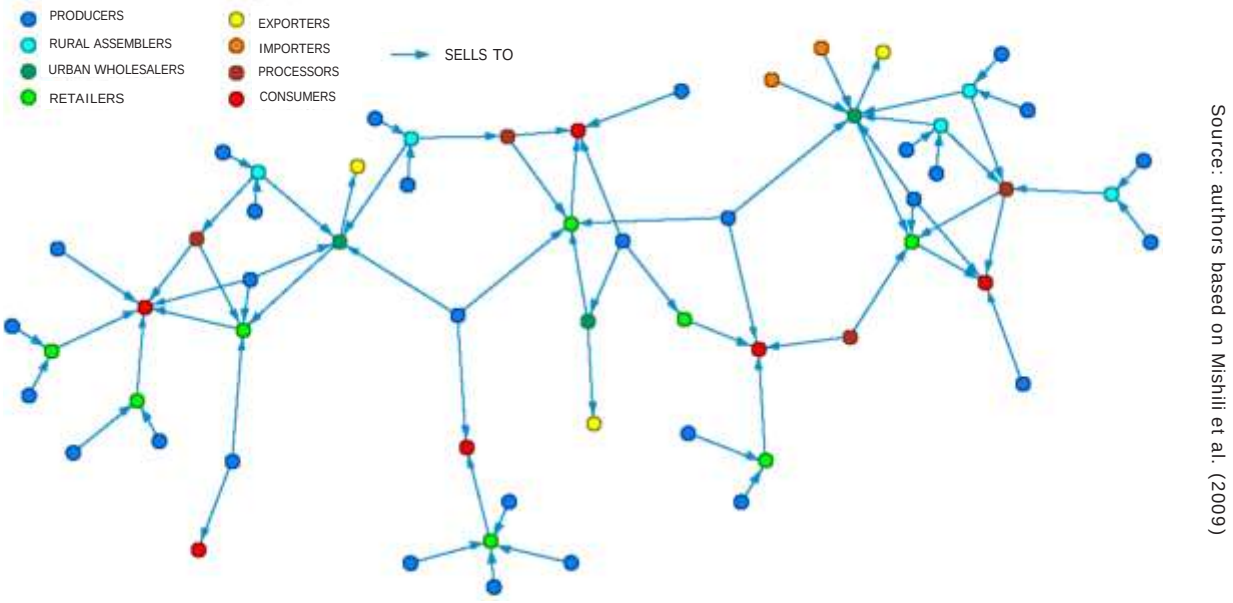
A relational approach such as SNA could also help development and humanitarian agencies understand why some households are more resilient to food insecurity than others. One of the key determinants of household resilience is the social ties that bind it to other households or networks (religious, economic, political) such as state representatives and/or non-governmental organizations (NGOs) and that can then be mobilized in times of crisis. SNA could help to assess how resilient each individual or household is by measuring how they are embedded within their community and to what extent they are able to build connections beyond their own group. The combination of embeddedness and brokerage – also known as "bonding" and "bridging" in the qualitative literature[21] – provided by social networks is ultimately what explains vast differences in social capital between individuals. This quantitative approach would complement existing approaches that aim at measuring the various dimensions of social capital and collect vast amount of data on the membership of individuals to social groups without necessarily focusing on their actual relationships.[22]

Market analysis is another area where network analysis could usefully complement existing approaches. Because most trade flows are informal in West Africa, market prices of commodities are often used as a proxy to estimate regional integration in the region.[23] Using a relational approach that maps how traders are actually connected across space through business ties could complement econometric methods based on prices and show the geographical extension of the trade networks as well as their degree of centralization. Along the Nigerian borders, for example, recent studies suggest that cross-border trade relies on a limited number of brokers who manage to bridge nationally organized markets, support the urbanization process and respond to the needs of the emerging middle-class in West Africa.[24]

Network studies could also help reconstruct food value chains that link producers to consumers across the region. As West Africa progressively shifts "from a subsistence-based economy to a market economy",[25] coordination between the actors processing, distributing and marketing food products becomes increasingly complex. This approach would highlight not only the division of labor and circulation of products between producers, assembly traders, wholesalers and retailers, but also the diversity of ties that bind actors from the same category and the diversity of profiles that such actors can have, as for the cow pea food supply chain presented on Figure 2. Instead of focusing exclusively on the hierarchy or on the successive tasks of the actors involved along supply chains, a full analysis of trade network that takes into account all relevant actors and ties would permit the study of how social structures facilitate or constrain business activities irrespective of their sector of activity.[26] This is particularly relevant in today's African economies, where large economic actors tend to diversify and seize market opportunities across hierarchical levels.

A visualization of food value chains through network analysis would greatly help policy-makers, development and humanitarian actors evaluate the response capability of trade networks to external shocks, as in Central African Republic, Northern Mali or the Lake Chad region where rebellions and terrorist groups disrupted market activities and trade networks.[27]

Figure 2. The cow pea food value chain



Source: authors based on Mishili et al. (2009)

"Gender, age and other important social dimensions play a central role in determining individual, household and community food **security and nutrition"**

Photo Credit : Anne Poulsen ©

NETWORK ANALYSIS AS AN EMPOWERMENT TOOL

Formal approaches that map social ties provide a visualization of the structural position of marginalized or vulnerable actors, groups and organizations which can often be difficult to ascertain when numerous actors are involved. SNA can contribute to empower marginalized actors by highlighting who is involved in the network, how influential each actor is, what makes central actors structurally important and how can marginalized actors be more central.[28]

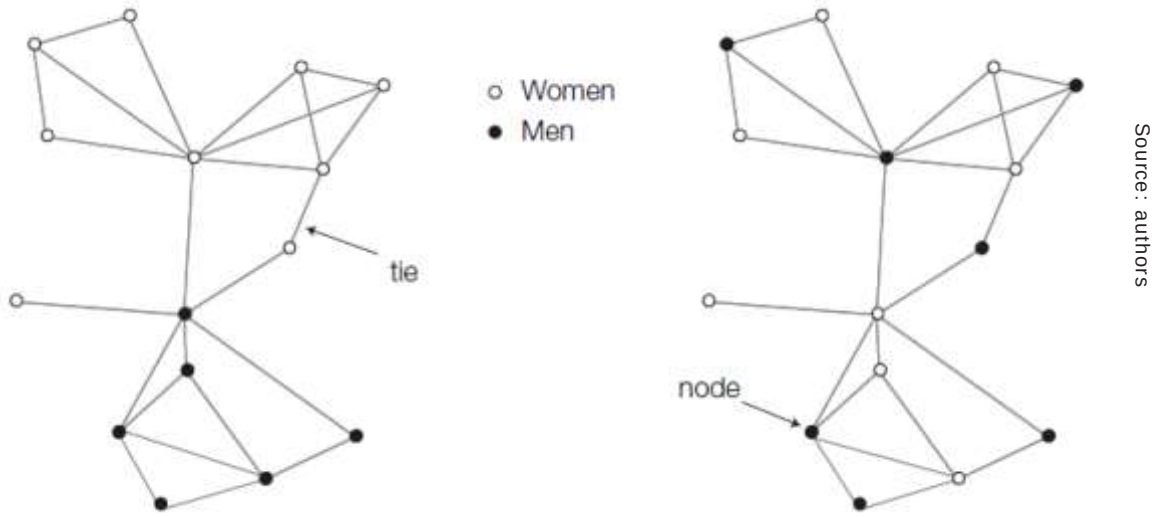
GENDER-SPECIFIC NETWORKS

Network approaches are particularly suitable to development and humanitarian agencies that implement public awareness and advocacy strategies around gender issues. Thus far, gender issues have mainly been addressed using the concept of homophily, i.e. the tendency for individuals sharing similar attributes, values or behaviours to associate with each other.[29] When applied to gender, this means that a homophilous network is a social structure in which men or women have comparatively more relationships within their own gender group than across gender. The network on the left-hand side of Figure 3 is a clear example of such network: women are rarely connected to men and vice versa. Conversely, a heterophilous network is a structure in which actors exchange significantly more with the opposite sex than within their own group, as on the right hand side of Figure 3, where most men and women have cross-gender relationships. Studies conducted in a variety of disciplinary and geographical contexts strongly supports homophily and gender-specific differences: men and women tend to manage their networks in ways that reflect substantially different social norms.[30]

Only a handful of these studies have formally addressed how social networks were patterned by gender in Sub-Saharan Africa[31], leaving room for further research. Gender – along with age, race, and ethnicity – is indeed a powerful factor structuring social relationships on the continent, where male and women labor contribution to food systems are often gender-specific. SNA could first be used to verify to what extent women and men tend to have distinctive cropping patterns, tend to different livestock, or sell different types, volumes and qualities of products along food value chains. A relational approach could then help explain how gender inequalities are reproduced through social norms that limit women's choices and opportunities. Women's participation to markets, for example, is significantly shaped by a gendered system of relationships, at the household and community level, that provide them access to information and agricultural resources.[32]

Understanding how gender is embedded in a wider system of socially mediated norms and practices and how the relations defining men and women's position in the social structure cause gender disparities is therefore of the highest importance for development and humanitarian agencies. Gender, age and other important social dimensions play a central role in determining individual, household and community food security and nutrition vulnerabilities for the World Food Programme (WFP), for example, whose aim is to deliver food assistance that meets the needs and priorities of women, men, girls, and boys, and to bridge the gender gap in food security and nutrition.[33]

FIGURE 3. A HOMOPHILOUS AND HETEROPHILOUS NETWORK



Source: authors

PERSPECTIVES

Social network analysis is a booming field of research that offers new insight into development and humanitarian agencies working in Sub-Saharan Africa. Its focus on the relationships between individuals or organizations makes SNA different from existing approaches that seek to explain variations in economic or social outcomes based on the attributes of the actors (age, income, poverty, etc.). Several decades of panel surveys have produced a wealth of data on the individual characteristics of social actors but comparatively little as to how they are actually connected within their households, extended family or community and to the larger world. In West Africa, one knows quite well what kind of commodities are produced, who are the main traders, and what consumption patterns have emerged, but less is known of the relationships that connects producers to consumers, across time and space. By considering the ties that bind social actors as its primary unit of analysis, SNA can highlight structural constraints and opportunities between men and women, between beneficiaries of food programs and traders, or between organizations involved in development policies that remain largely unknown.

SNA is a rather flexible approach that can also complement qualitative and quantitative studies and surveys conducted in the region. Historical and biographical records can provide valuable information about the intensity and formation of ties that can be incorporated in SNA to better understand their temporal evolution.[34] Subject to certain precautions, network data can also be used in econometric studies as potential explanations for variation in social or economic outcomes. In order to deal with the fact that actors engaged in social networks are statistically dependent, new statistical tools have been developed for constructing tests of significance and probability models that take into consideration dependencies, such as Exponential Random Graph Models (ERGMs). One should note, however, that existing panel data based on population sample can rarely been used as such by SNA and data must be collected in a new manner. In many cases, sampling a population in which the relations between the actors is unknown is problematic. In order to solve this issue, SNA has developed snowballing techniques that often require either a sample of ego networks (one particular actor and its connections) or a survey of entire populations (or at least 80% of the relevant actors involved in the network).

SNA has the potential to be more widely used by development and humanitarian analysts and policy makers. On the one hand, SNA highlights that the properties of social networks are not solely determined by the individual characteristics of the people embedded in them but that they also depend on the structure of human interactions. A network composed of a given number of nodes and ties can have a centralized structure that will benefit a few central players, or a decentralized structure that will favor a more equal distribution of resources or power among peers. On the other hand, SNA is not purely confined to the study of the links that bind individuals, groups and larger entities. It also acknowledges that individual actors have their own agency and can alter the structure of a network to their advantage, by creating new alliances with well-connected players, play the role of brokers or disseminate information that can influence the values and behaviors of their peers. The ability to understand both the collective constraints and opportunities offered by social structures and the individual strategies developed by social actors is particularly crucial in West Africa, where social networks − rather than formal institutions − play a critical role in protecting farmers, herders, traders against the worst impact of weather disasters, food insecurity, and political crises.

“SNA is a rather flexible approach that can also complement qualitative and quantitative studies and surveys conducted in the **region.”**

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FOOTNOTES

1 Papachristos 2009, Christakis and Fowler 2007, 2010, González-Bailóna and Wang 2016, Fafchamps 2004

2 For an introduction, see Borgatti et al. 2009, Robins 2015

3 The note draws on a 4-day training organized by the World Food Programme West African Regional Office in May 2017 in Dakar, Senegal.

4 Mitchell 1969

5 Walther 2014

6 Fafchamps and Minten 1999, Fafchamps 2001

7 Kuepié et al. 2015

8 Walther 2015

9 Chipika and Wilson 2006

10 Ishiwata et al. 2014

11 Berrou and Combarnous 2011

12 Rooks et al. 2014

13 Schöer et al. 2012, Mano et al. 2011, Nordman and Pasquier-Doumer 2015

14 Bandeira and Rasul 2006, Spielman et al. 2011, Bourne et al. 2017

15 Matouš et al. 2013, see also Isaac and Matouš 2017

16 Conley and Udry 2010

17 Akoten and Otsuka 2007

18 Bloom et al. 2008, Schiffer et al. 2010, Spielman et al. 2011, Schiffer 2012, OECD/SWAC 2017

19 OECD/SWAC 2017

20 OECD 2017

21 Woolcock and Narayan 2000

22 Grootaert et al. 2004

23 Aker et al. 2014

24 Walther 2015

25 Allen and Heinrigs 2016: 8

26 Walther 2014

27 WFP 2016

28 IRC 2016

29 McPherson et al. 2001

30 Brashears 2008, Stehlé et al. 2013, Szell and Thurner 2013

31 Adams et al. 2002, Caudell et al. 2015, Mekonnen et al. 2017

32 World Bank 2012

33 WFP, Regional Bureau Dakar 2017

34 Walther et al. 2015

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